Security Auditor Program - User Manual

Contents

Overview

The Security Auditor Program is a comprehensive toolset designed for performing security audits on Windows systems. It allows you to perform remote audits on multiple systems concurrently and process audit results locally, providing an in-depth understanding of your security posture.

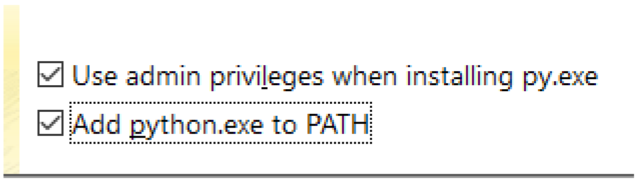
Program Directory Structure

```
Security Auditor Program (Python)/
        |- config/
        |       |- config.xlsx
        |- script /
        |       |- CIS_Microsoft_Windows_Server_2016_Benchmark_v2.0.0_L1_MS.ps1
        |       |- CIS_Microsoft_Windows_Server_2019_Benchmark_v2.0.0_L1_DC.ps1
        |       |- ……
        |- src/
        |       |- Audit/
        |       |       |- CIS_Microsoft_Windows_Server_2016_Benchmark_v2.0.0_L1_MS.xlsx
        |       |       |- CIS_Microsoft_Windows_Server_2019_Benchmark_v2.0.0_L1_DC.xlsx
        |       |       |- ……
        |       |- CIS/
        |       |       |- CIS_Microsoft_Windows_Server_2016_Benchmark_v2.0.0_L1_MS.audit
        |       |       |- CIS_Microsoft_Windows_Server_2019_Benchmark_v2.0.0_L1_DC.audit
        |       |       |- ……
        |- utilities/
        |       |- __init__.py
        |       |- getAnonySID.py
        |       |- getAuditPolicy.py
        |       |- getBannerCheck.py
        |       |- getCheckAccount.py
        |       |- getLockoutPolicy.py
        |       |- getPwdPolicy.py
        |       |- getRegCheck.py
        |       |- getRegValue.py
        |       |- getUserRights.py
        |       |- getWMIPolicy.py
        |- audit_file_parser.py
        |- local_audit_command_generator.py
        |- local_audit_results_processor.py
        |- remote_audit_executor.py
        |- remote_host_checker.py
```

Installation Guide

Python Installation

- Install Python version > 3.7
- Remember to select "Add python.exe to PATH"

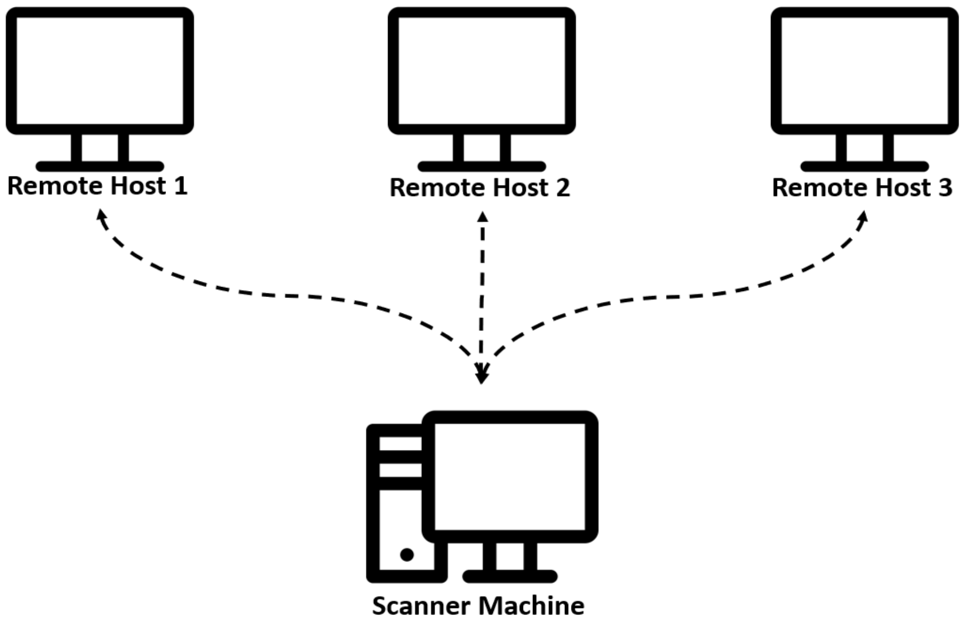


☑ Use admin privileges when installing py.exe
☑ Add python.exe to PATH

Python Packages Installation

- Install Python packages using pip
    - pip install bs4 lxml pandas argparse openpyxl regex pypsexec smbprotocol

Remote Host Requirements (Remote version only)



Enable administrative shares

- *Checking if Administrative Shares are Enabled.*
    1. Open Command Prompt with administrative privileges. You can do this by searching for `` `**cmd**` `` in the Start menu, right-clicking on `` `**Command Prompt**` ``, and selecting `` `**Run as administrator**` ``.
    2. Type `` `**net share**` `` and press Enter. This command will display all network shares that are currently available on the system.

3. Look at the output. If administrative shares are enabled, you should see entries like **`C$`**, **`ADMIN$`**, etc.

- *Enabling Administrative Shares*
  1. If you did not see the administrative shares in the output of the net share command, follow these steps to enable them:
  2. Press **`Win + R`** to open the Run dialog, type **`regedit`** and press Enter to open the Registry Editor.
  3. Navigate to **`HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\LanmanServer\Parameters`**.
  4. Right-click in the right pane and select New → DWORD (32-bit) Value.
  5. Name the new value **`AutoShareWks`** for workstations or **`AutoShareServer`** for servers.
  6. Double-click the new value and set its data to **`1`**.
  7. **Restart** your computer to apply changes.

Turn off User Account Control (UAC)

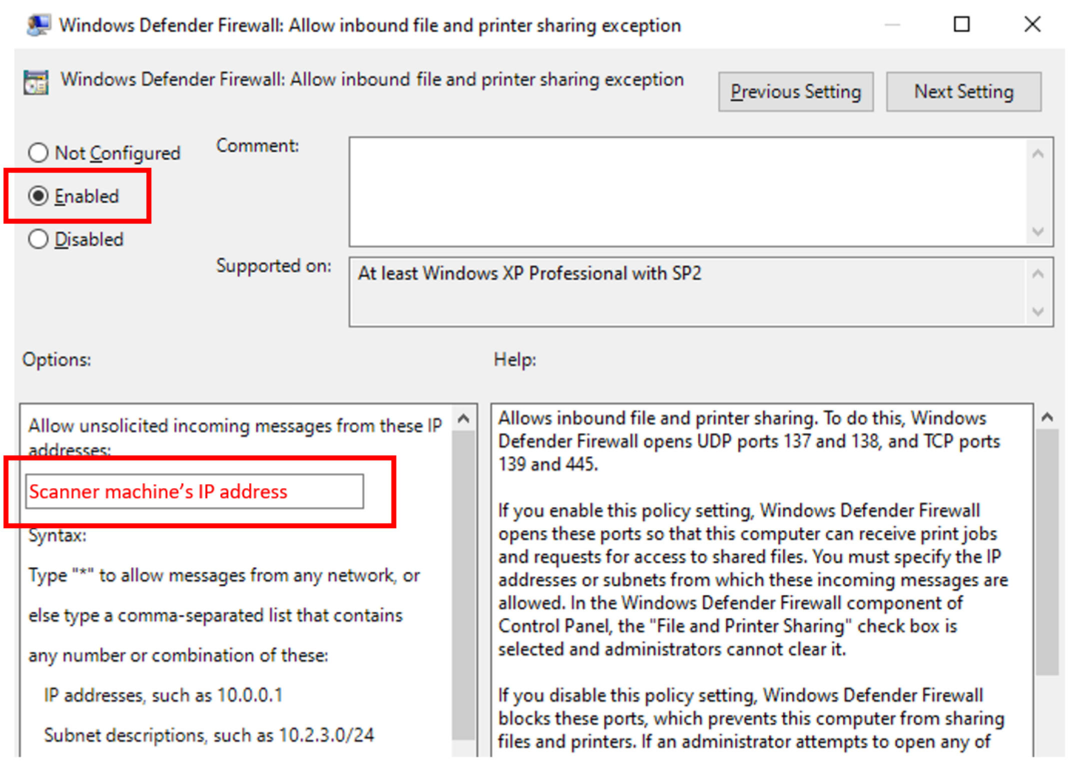
1. Press **`Win + R`**, type **`regedit`**, and press Enter to open the Registry Editor.
2. Navigate to **`HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Policies\System`**.
3. Right-click in the right pane, select New → DWORD (32-bit) Value, and name it **`LocalAccountTokenFilterPolicy`**.
4. Double-click the new value and set its data to **`1`**.
5. **Restart** your computer to apply changes.

Configure Host Firewall

- *Choice 1: Disable the firewall.*
  - It's recommended to disable the firewall for simplicity, but this should only be done with caution due to potential security risks. If you choose this option, no further steps are necessary.

- *Choice 2: Adjust firewall settings.*
  1. Press **`Win+R`** to open the Run dialog, type **`gpedit.msc`** and press Enter to open the Group Policy Object Editor.
  2. Navigate to **`Local Computer Policy > Administrative Templates > Network > Network Connections`**.
  3. Locate the setting **`Prohibit use of Internet connection firewall on your DNS domain`**. Set this option to either **`Disabled`** or **`Not Configured`**.
  4. Next, navigate to **`Local Computer Policy > Computer Configuration > Administrative Templates > Network > Network Connections > Windows Defender Firewall > Standard Profile`**.

5. Find the setting `**Windows Firewall: Allow inbound file and printer sharing exception**`, enable it, and set the option to allow messages specifically from the scanner machine's IP address.



Windows Defender Firewall: Allow inbound file and printer sharing exception

Windows Defender Firewall: Allow inbound file and printer sharing exception

Previous Setting | Next Setting

( ) Not Configured
[✓ Enabled]
( ) Disabled

Comment:

Supported on: At least Windows XP Professional with SP2

Options:

Allow unsolicited incoming messages from these IP addresses:

Scanner machine's IP address

Syntax:

Type "*" to allow messages from any network, or

else type a comma-separated list that contains

any number or combination of these:

IP addresses, such as 10.0.0.1

Subnet descriptions, such as 10.2.3.0/24

Help:

Allows inbound file and printer sharing. To do this, Windows Defender Firewall opens UDP ports 137 and 138, and TCP ports 139 and 445.

If you enable this policy setting, Windows Defender Firewall opens these ports so that this computer can receive print jobs and requests for access to shared files. You must specify the IP addresses or subnets from which these incoming messages are allowed. In the Windows Defender Firewall component of Control Panel, the "File and Printer Sharing" check box is selected and administrators cannot clear it.

If you disable this policy setting, Windows Defender Firewall blocks these ports, which prevents this computer from sharing files and printers. If an administrator attempts to open any of

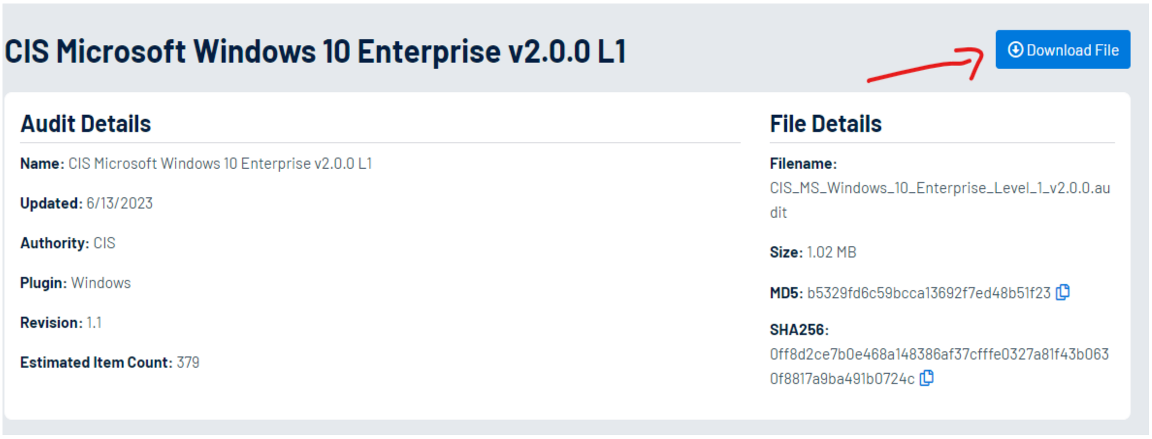
Running the Program

Audit File Preparation

The audit process begins with the preparation of an audit file, which forms the basis for subsequent audit operations. Follow these steps to prepare your audit file:

1. Download the latest CIS benchmark Windows Level 1 .audit file from Nessus. You can find it using the following URL: https://www.tenable.com/audits/search?q=windows+L1+AND+type%3A%28CIS%29+AND+display_name%3A%28L1%29+AND+plugin%3A%28Windows%29&sort=&page=1

   For instance, you might download a file like: https://www.tenable.com/audits/CIS_MS_Windows_10_Enterprise_Level_1_v2.0.0

   CIS Microsoft Windows 10 Enterprise v2.0.0 L1

   Audit Details

   Name: CIS Microsoft Windows 10 Enterprise v2.0.0 L1

   Updated: 6/13/2023

   Authority: CIS

   Plugin: Windows

   Revision: 1.1

   Estimated Item Count: 379

   File Details

   Filename: CIS_MS_Windows_10_Enterprise_Level_1_v2.0.0.audit

   Size: 1.02 MB

   MD5: b5329fd6c59bcca13692f7ed48b51f23

   SHA256: 0ff8d2ce7b0e468a148386af37cfffe0327a81f43b0630f8817a9ba491b0724c

2. Run the `**audit_file_parser.py**` script from the command line, passing the path of the .audit file as an argument.
   Here's an example:
   - python audit_file_parser.py -audit /path/to/audit/file

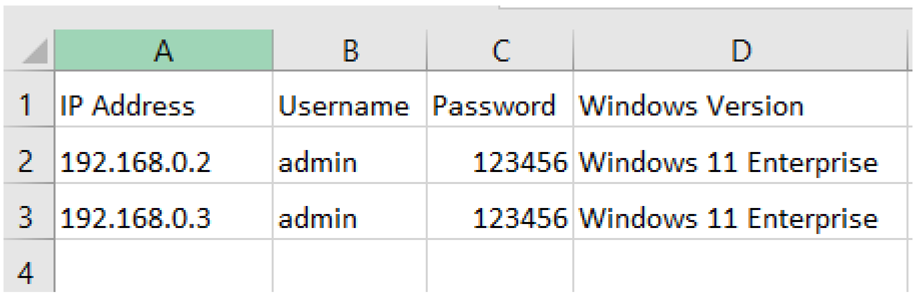
3. Upon successful completion of the script, you'll find an Excel file in the `/src/Audit` directory. This file, which will have the same name as the input .audit file, contains the results of the script's operations.

4. At this point, you can proceed to customize the Excel file according to your specific requirements. This custom file will serve as the input for the audit process. Be sure to save any changes you make.

Running the Program Remotely

Conducting a remote audit with the Security Auditor Program involves a few key steps. Follow this guide to set up and execute a remote security audit:

1. Prepare the configuration file, which is named `` `config.xlsx` `` and located in the config directory. This file should contain important details for the security audit, including the IP address, username, password, and Windows version of the target system.

	A	B	C	D
1	IP Address	Username	Password	Windows Version
2	192.168.0.2	admin	123456	Windows 11 Enterprise
3	192.168.0.3	admin	123456	Windows 11 Enterprise
4				

   Ensure that the provided account has administrator privileges.
   To maintain consistency in the audit process, make sure to select the same Windows version each time you run the program.

2. Run the **`remote_host_checker.py`** script from the command line, passing the path of the configuration file as an argument.
   Here's an example:
   - python remote_host_checker.py -config config.xlsx
   - In this command, config.xlsx is the path to the configuration file

3. Once the script has finished running, review its output. The script checks various remote host requirements, such as whether administrative shares are enabled, if User Account Control (UAC) is turned off, and if the host firewall is correctly configured.

4. If the remote hosts fulfil the requirements, you can now execute the **`remote_audit_executor.py`** script. Run this script from the command line, specifying the path to the configuration file and the output file.
   Here's an example:
   - python remote_audit_executor.py -config config.xlsx -output output.xlsx
   - In this command, config.xlsx is the path to the configuration file and output.xlsx will be the name of the output file.

5. Once the script has finished running, you can review the results in the specified output file (output.xlsx in the example above). This file will contain the findings from the security audit.

By following these steps, you can successfully conduct a remote security audit using the Security Auditor Program. Remember to refer to the Common Troubleshoots section of this manual if you encounter any issues during this process.

Running the Program Locally

If you prefer to conduct the audit on a local system, follow these steps:

1. Run the `` `local_audit_command_generator.py` `` script from the command line. Pass the path of the audit file as an argument.
   Here's an example:
   - python local_audit_command_generator.py -audit audit_file.xlsx
   - This script will generate a PowerShell script (.ps1) with the same name as the input audit file and place it in the `` `/script` `` directory.

2. Copy the generated PowerShell script to the target host. Run this script in PowerShell (in Administrator mode) and export the result into a text file. It also exports the error code log to debug_log.txt, which can be used for debugging purposes.
   Here's an example:
   - ./script_name.ps1 > audit_result.txt 2> debug_log.txt

   If you encounter a permission error, you may need to change the execution policy by running this command:
   - Set-ExecutionPolicy Unrestricted

3. Once the PowerShell script has completed, copy the output file (audit_result.txt) back to the local host.

4. Now you can process the audit results. Run the **`` `local_audit_results_processor.py` ``** script from the command line, passing the path of the result file, audit file, and output file.
   Here's an example:
   - python local_audit_results_processor.py -audit audit_file.xlsx -ps_result audit_result.txt -output output.xlsx
   - In this command, audit_file.xlsx is the audit file, audit_result.txt is the file you copied from the target host, and output.xlsx is where the script will write the output.
5. Wait for the script to finish running. You can then review the results in the output file (output.xlsx).

By following these steps, you can perform a thorough local audit using the Security Auditor Program. If you encounter any issues, refer to the Common Troubleshoots section of this manual for help.

Common Troubleshoots

The following guidelines provide solutions to some common issues that you might encounter while running the remote audit script. They cover problems ranging from initial setup and file access to network issues and performance concerns. These suggestions are designed to assist in resolving issues in a systematic way.

Script fails to run

- Make sure Python is installed and properly configured on your machine.
- Ensure that all required Python packages are installed. These might include pandas, openpyxl, and any others imported in the script.

Script cannot read the configuration or audit files

- Make sure the paths to the files are correct.
- Ensure the files are formatted correctly.
- Make sure the script has read permissions for these files.
- Make sure all the target systems specified in a single Excel configuration file share the same Windows version

Script cannot write the output file

- Make sure the script has write permissions in the directory where it's trying to write the output file.
- If the file is already open, close it before running the script.

Script fails to connect to the target systems

- Ensure the target systems are up and running.
- Check the network connection between the machine running the script and the target systems.
- Make sure the IP addresses, usernames, and passwords in the configuration file are correct.
- Make sure the account used is administrator account. (remote only)
- Make sure the registry and firewall settings are correct.
- Error messages:
    - “[WinError 10060] A connection attempt failed because the connected party did not properly respond after a period of time, or established connection failed because connected host has failed to respond.”
    - “smbprotocol.exceptions.LogonFailure: Received unexpected status from the server: The attempted logon is invalid. This is either due to a bad username or authentication information.”
    - “AttributeError: 'NoneType' object has no attribute 'open_service_w'.”

Script returns incorrect or unexpected audit results

- Verify the audit commands in the Excel file and in the gen_ps_args function.
- Make sure the target systems have the required features enabled and permissions set to allow the script to perform its tasks.

Script runs slowly or hangs

- Try reducing the number of target systems or the number of audit tasks.
- Check the system resources on the machine running the script. It may need more memory or CPU power to handle the tasks.

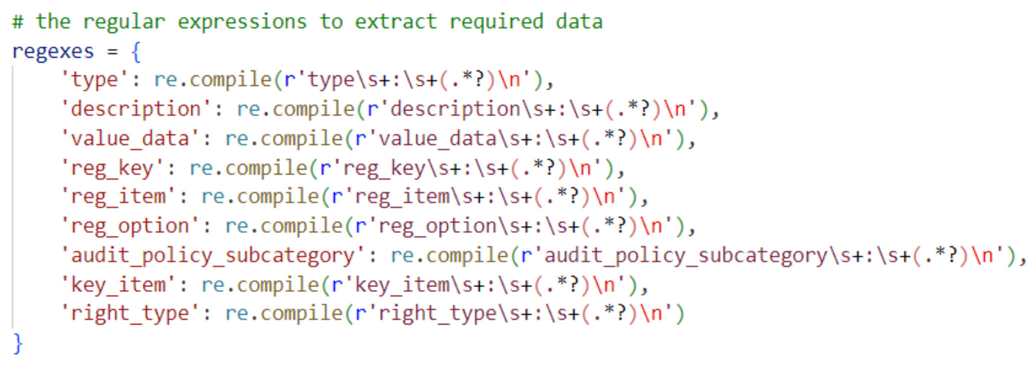
Place for Updates

This section is designed to guide future developers who might wish to modify or expand the functionality of these scripts. It identifies key areas in the code that are likely to require updates or modifications to meet changing requirements or to add new features. In this section, detailed explanations will be provided on the areas in each Python script that may require modifications.

audit_file_parser.py:

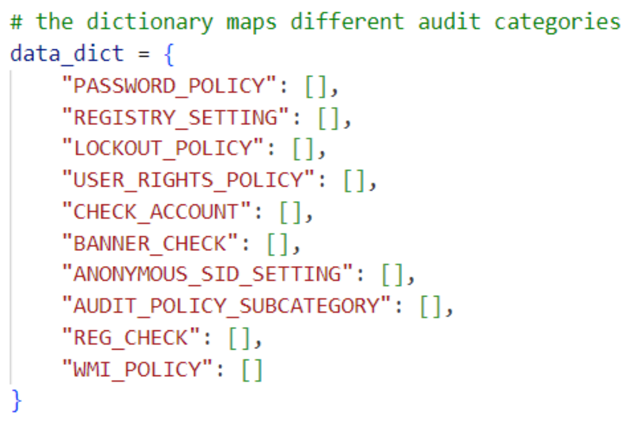
If Nessus updates the format of the `.audit` file, the following places are likely to require updates.

- This is the place to update regular expressions based on the `.audit` file.



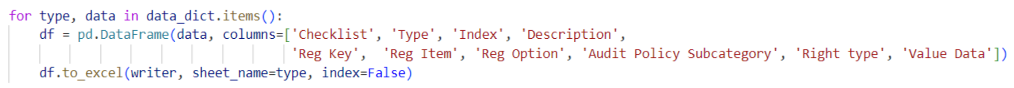
```python
# the regular expressions to extract required data
regexes = {
    'type': re.compile(r'type\s+:\s+(.*?)\n'),
    'description': re.compile(r'description\s+:\s+(.*?)\n'),
    'value_data': re.compile(r'value_data\s+:\s+(.*?)\n'),
    'reg_key': re.compile(r'reg_key\s+:\s+(.*?)\n'),
    'reg_item': re.compile(r'reg_item\s+:\s+(.*?)\n'),
    'reg_option': re.compile(r'reg_option\s+:\s+(.*?)\n'),
    'audit_policy_subcategory': re.compile(r'audit_policy_subcategory\s+:\s+(.*?)\n'),
    'key_item': re.compile(r'key_item\s+:\s+(.*?)\n'),
    'right_type': re.compile(r'right_type\s+:\s+(.*?)\n')
}
```

- This is the place to update dictionary that maps different audit categories.



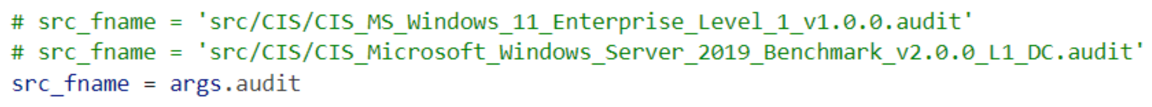
```python
# the dictionary maps different audit categories
data_dict = {
    "PASSWORD_POLICY": [],
    "REGISTRY_SETTING": [],
    "LOCKOUT_POLICY": [],
    "USER_RIGHTS_POLICY": [],
    "CHECK_ACCOUNT": [],
    "BANNER_CHECK": [],
    "ANONYMOUS_SID_SETTING": [],
    "AUDIT_POLICY_SUBCATEGORY": [],
    "REG_CHECK": [],
    "WMI_POLICY": []
}
```

- This is the place to modify the column name of the output file.



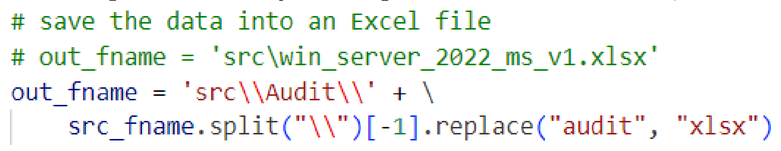
```python
for type, data in data_dict.items():
    df = pd.DataFrame(data, columns=['Checklist', 'Type', 'Index', 'Description',
                                     'Reg Key',  'Reg Item', 'Reg Option', 'Audit Policy Subcategory', 'Right type', 'Value Data'])
    df.to_excel(writer, sheet_name=type, index=False)
```

- This comment is for testing purposes.



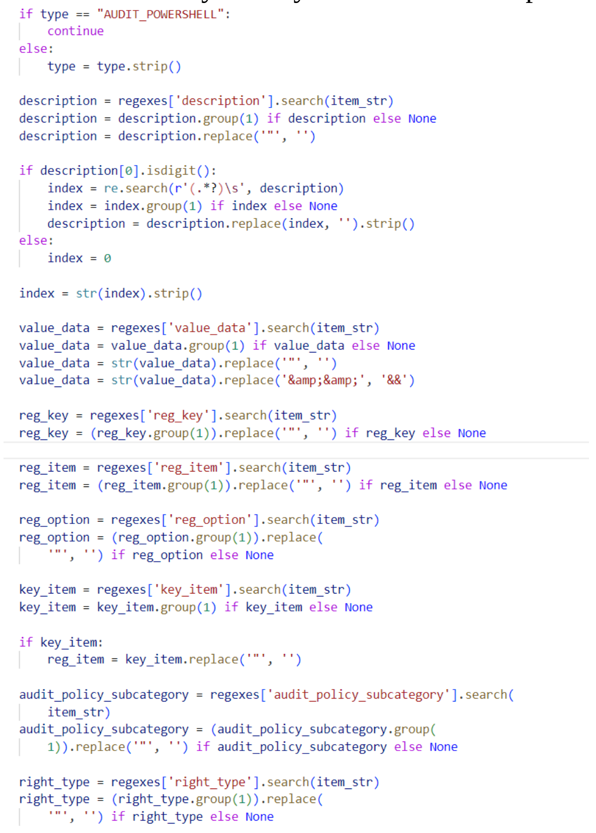
```python
# src_fname = 'src/CIS/CIS_MS_Windows_11_Enterprise_Level_1_v1.0.0.audit'
# src_fname = 'src/CIS/CIS_Microsoft_Windows_Server_2019_Benchmark_v2.0.0_L1_DC.audit'
src_fname = args.audit
```

- This is the place to modify the output file name if needed. (Not recommended)

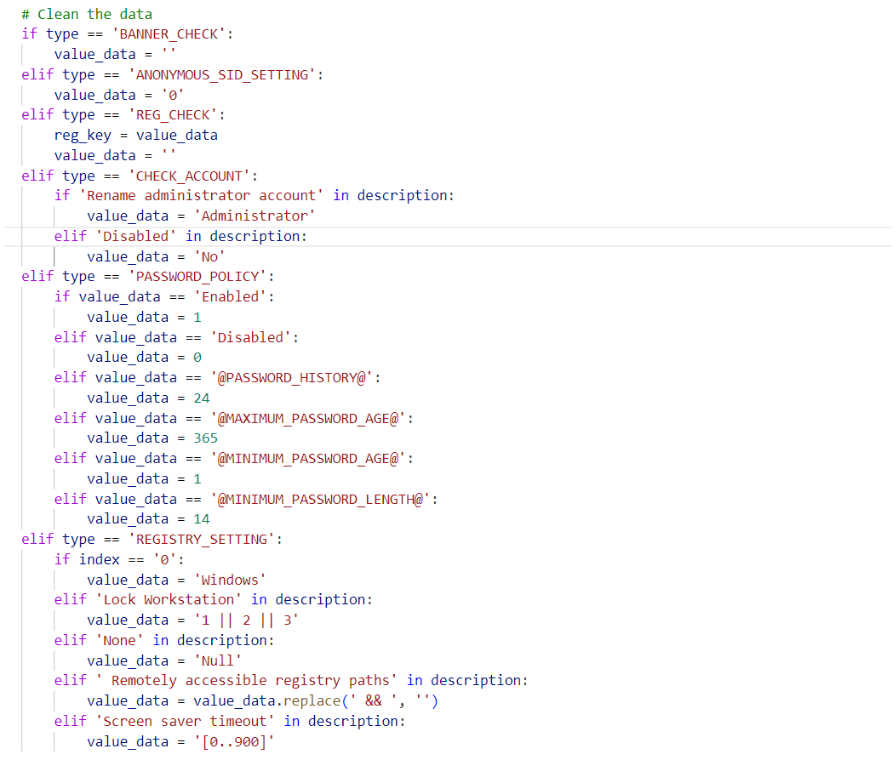


```python
# save the data into an Excel file
# out_fname = 'src\win_server_2022_ms_v1.xlsx'
out_fname = 'src\\Audit\\' + \
    src_fname.split("\\")[-1].replace("audit", "xlsx")
```

- These are the places to update the rule of cleaning the data. If you miss some irregular data, you can also manually modify the data in the output `.xlsx` file.



```python
if type == "AUDIT_POWERSHELL":
    continue
else:
    type = type.strip()

description = regexes['description'].search(item_str)
description = description.group(1) if description else None
description = description.replace('"', '')

if description[0].isdigit():
    index = re.search(r'(.*?)\s', description)
    index = index.group(1) if index else None
    description = description.replace(index, '').strip()
else:
    index = 0

index = str(index).strip()

value_data = regexes['value_data'].search(item_str)
value_data = value_data.group(1) if value_data else None
value_data = str(value_data).replace('"', '')
value_data = str(value_data).replace('&amp;&amp;', '&&')

reg_key = regexes['reg_key'].search(item_str)
reg_key = (reg_key.group(1)).replace('"', '') if reg_key else None

reg_item = regexes['reg_item'].search(item_str)
reg_item = (reg_item.group(1)).replace('"', '') if reg_item else None

reg_option = regexes['reg_option'].search(item_str)
reg_option = (reg_option.group(1)).replace(
    '"', '') if reg_option else None

key_item = regexes['key_item'].search(item_str)
key_item = key_item.group(1) if key_item else None

if key_item:
    reg_item = key_item.replace('"', '')

audit_policy_subcategory = regexes['audit_policy_subcategory'].search(
    item_str)
audit_policy_subcategory = (audit_policy_subcategory.group(
    1)).replace('"', '') if audit_policy_subcategory else None

right_type = regexes['right_type'].search(item_str)
right_type = (right_type.group(1)).replace(
    '"', '') if right_type else None
```

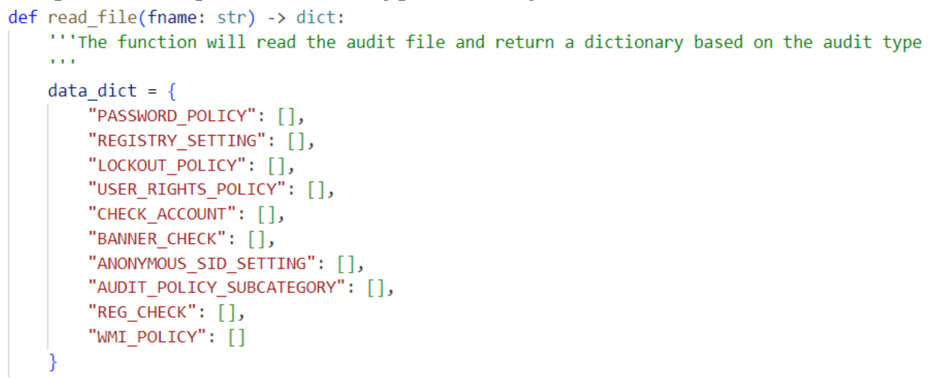


```python
# Clean the data
if type == 'BANNER_CHECK':
    value_data = ''
elif type == 'ANONYMOUS_SID_SETTING':
    value_data = '0'
elif type == 'REG_CHECK':
    reg_key = value_data
    value_data = ''
elif type == 'CHECK_ACCOUNT':
    if 'Rename administrator account' in description:
        value_data = 'Administrator'
    elif 'Disabled' in description:
        value_data = 'No'
elif type == 'PASSWORD_POLICY':
    if value_data == 'Enabled':
        value_data = 1
    elif value_data == 'Disabled':
        value_data = 0
    elif value_data == '@PASSWORD_HISTORY@':
        value_data = 24
    elif value_data == '@MAXIMUM_PASSWORD_AGE@':
        value_data = 365
    elif value_data == '@MINIMUM_PASSWORD_AGE@':
        value_data = 1
    elif value_data == '@MINIMUM_PASSWORD_LENGTH@':
        value_data = 14
elif type == 'REGISTRY_SETTING':
    if index == '0':
        value_data = 'Windows'
    elif 'Lock Workstation' in description:
        value_data = '1 || 2 || 3'
    elif 'None' in description:
        value_data = 'Null'
    elif ' Remotely accessible registry paths' in description:
        value_data = value_data.replace(' && ', '')
    elif 'Screen saver timeout' in description:
        value_data = '[0..900]'
```

local_audit_command_generator.py

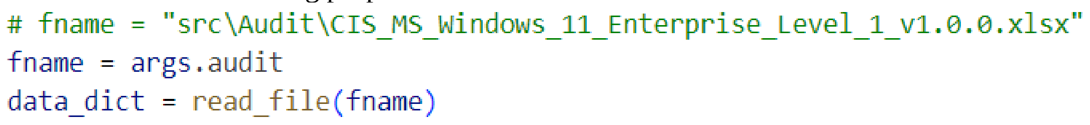
If you updated the audit type name or column name, you will have to modify the name in this script as well. If you need to update PowerShell commands, please refer to the details in ‘PowerShell Commands’ section.

- This place is to update the audit type name if you have modified before.



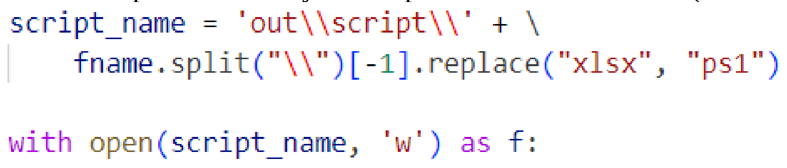
```python
def read_file(fname: str) -> dict:
    '''The function will read the audit file and return a dictionary based on the audit type
    '''
    data_dict = {
        "PASSWORD_POLICY": [],
        "REGISTRY_SETTING": [],
        "LOCKOUT_POLICY": [],
        "USER_RIGHTS_POLICY": [],
        "CHECK_ACCOUNT": [],
        "BANNER_CHECK": [],
        "ANONYMOUS_SID_SETTING": [],
        "AUDIT_POLICY_SUBCATEGORY": [],
        "REG_CHECK": [],
        "WMI_POLICY": []
    }
```

- This comment is for testing purposes.



```python
# fname = "src\Audit\CIS_MS_Windows_11_Enterprise_Level_1_v1.0.0.xlsx"
fname = args.audit
data_dict = read_file(fname)
```

- This is the place to modify the output file name if needed. (Not recommended)

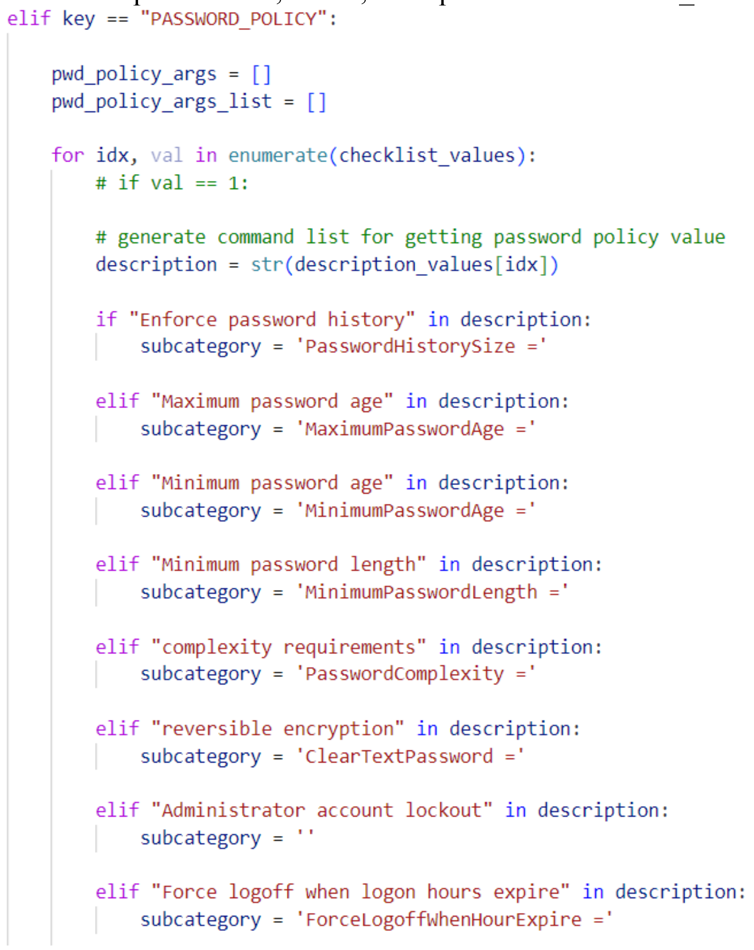


```python
script_name = 'out\\script\\' + \
    fname.split("\\")[-1].replace("xlsx", "ps1")

with open(script_name, 'w') as f:
```

- This is the place to add, delete, and update ‘REGISTRY_SETTING’ commands.

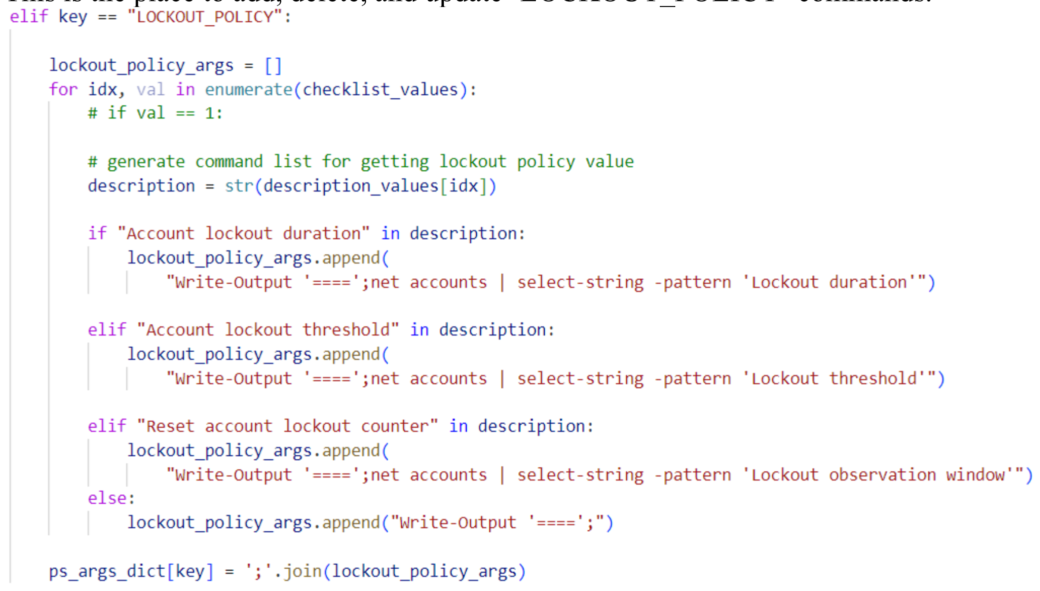
```
if key == "REGISTRY_SETTING":

    reg_value_args = []
    reg_value_args_list = []

    for idx, val in enumerate(checklist_values):
        # generate command list for getting regristry value
        reg_key = str(reg_key_values[idx])
        reg_item = str(reg_item_values[idx])

        if reg_key.startswith("HKLM"):
            reg_key = reg_key.replace("HKLM", "HKLM:")
        elif reg_key.startswith("HKU"):
            reg_key = reg_key.replace("HKU", "HKU:")

        arg = f"Write-Output '===';Get-ItemPropertyValue -Path '{reg_key}' -Name '{reg_item}'"
        reg_value_args.append(arg)

    reg_value_args_list.append(';'.join(reg_value_args))

    ps_args_dict[key] = ';'.join(reg_value_args)
```

- This is the place to add, delete, and update ‘PASSWORD_POLICY’ commands.



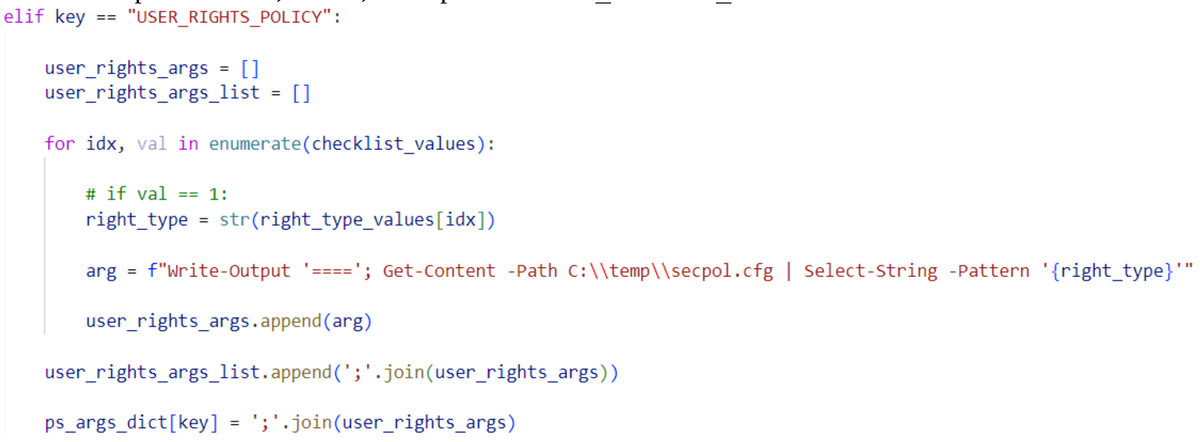
```
elif key == "PASSWORD_POLICY":

    pwd_policy_args = []
    pwd_policy_args_list = []

    for idx, val in enumerate(checklist_values):
        # if val == 1:

        # generate command list for getting password policy value
        description = str(description_values[idx])

        if "Enforce password history" in description:
            subcategory = 'PasswordHistorySize ='

        elif "Maximum password age" in description:
            subcategory = 'MaximumPasswordAge ='

        elif "Minimum password age" in description:
            subcategory = 'MinimumPasswordAge ='

        elif "Minimum password length" in description:
            subcategory = 'MinimumPasswordLength ='

        elif "complexity requirements" in description:
            subcategory = 'PasswordComplexity ='

        elif "reversible encryption" in description:
            subcategory = 'ClearTextPassword ='

        elif "Administrator account lockout" in description:
            subcategory = ''

        elif "Force logoff when logon hours expire" in description:
            subcategory = 'ForceLogoffWhenHourExpire ='
```

- This is the place to add, delete, and update ‘LOCKOUT_POLICY’ commands.



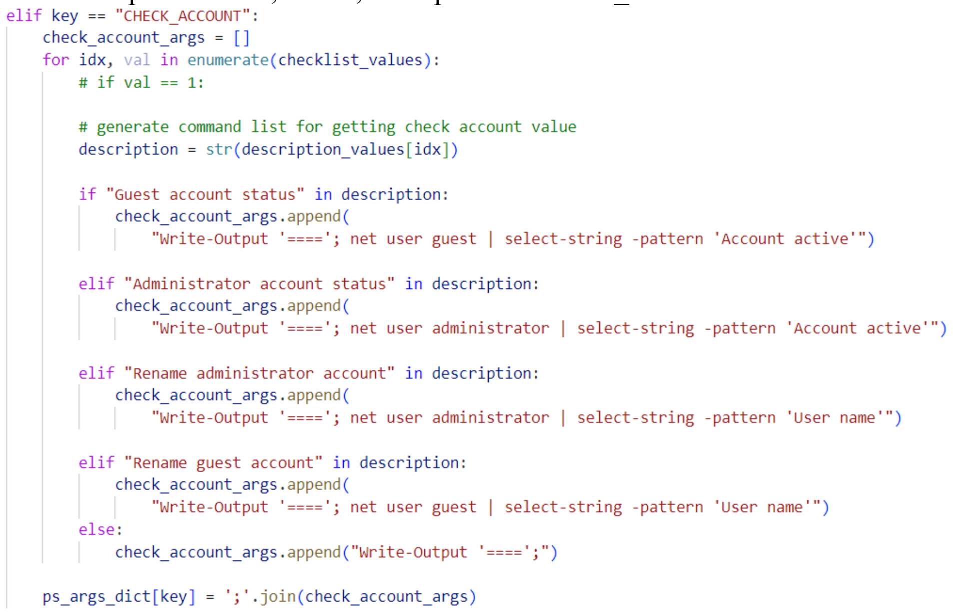
```
elif key == "LOCKOUT_POLICY":

    lockout_policy_args = []
    for idx, val in enumerate(checklist_values):
        # if val == 1:

        # generate command list for getting lockout policy value
        description = str(description_values[idx])

        if "Account lockout duration" in description:
            lockout_policy_args.append(
                "Write-Output '====';net accounts | select-string -pattern 'Lockout duration'")

        elif "Account lockout threshold" in description:
            lockout_policy_args.append(
                "Write-Output '====';net accounts | select-string -pattern 'Lockout threshold'")

        elif "Reset account lockout counter" in description:
            lockout_policy_args.append(
                "Write-Output '====';net accounts | select-string -pattern 'Lockout observation window'")
        else:
            lockout_policy_args.append("Write-Output '====';")

    ps_args_dict[key] = ';'.join(lockout_policy_args)
```

- This is the place to add, delete, and update ‘USER_RIGHTS_POLICY’ commands.



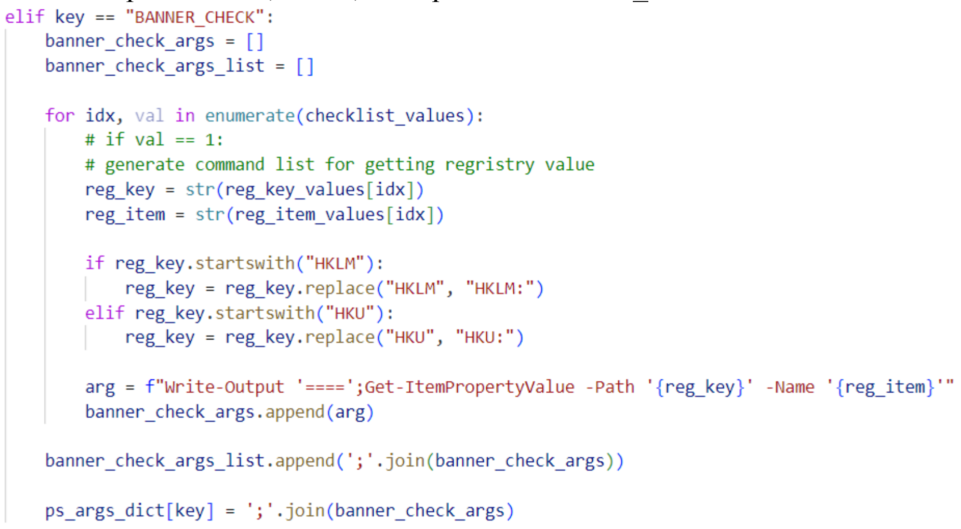
```
elif key == "USER_RIGHTS_POLICY":

    user_rights_args = []
    user_rights_args_list = []

    for idx, val in enumerate(checklist_values):

        # if val == 1:
        right_type = str(right_type_values[idx])

        arg = f"Write-Output '===='; Get-Content -Path C:\\temp\\secpol.cfg | Select-String -Pattern '{right_type}'"

        user_rights_args.append(arg)

    user_rights_args_list.append(';'.join(user_rights_args))

    ps_args_dict[key] = ';'.join(user_rights_args)
```

- This is the place to add, delete, and update ‘CHECK_ACCOUNT’ commands.



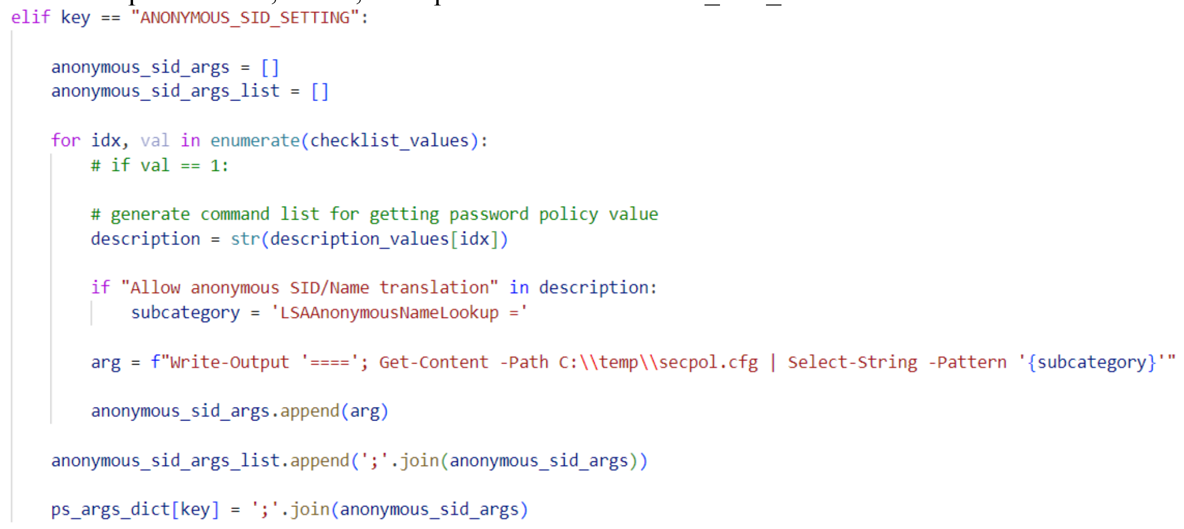
```
elif key == "CHECK_ACCOUNT":
    check_account_args = []
    for idx, val in enumerate(checklist_values):
        # if val == 1:

        # generate command list for getting check account value
        description = str(description_values[idx])

        if "Guest account status" in description:
            check_account_args.append(
                "Write-Output '===='; net user guest | select-string -pattern 'Account active'")

        elif "Administrator account status" in description:
            check_account_args.append(
                "Write-Output '===='; net user administrator | select-string -pattern 'Account active'")

        elif "Rename administrator account" in description:
            check_account_args.append(
                "Write-Output '===='; net user administrator | select-string -pattern 'User name'")

        elif "Rename guest account" in description:
            check_account_args.append(
                "Write-Output '===='; net user guest | select-string -pattern 'User name'")
        else:
            check_account_args.append("Write-Output '====';")

    ps_args_dict[key] = ';'.join(check_account_args)
```

- This is the place to add, delete, and update ‘BANNER_CHECK’ commands.



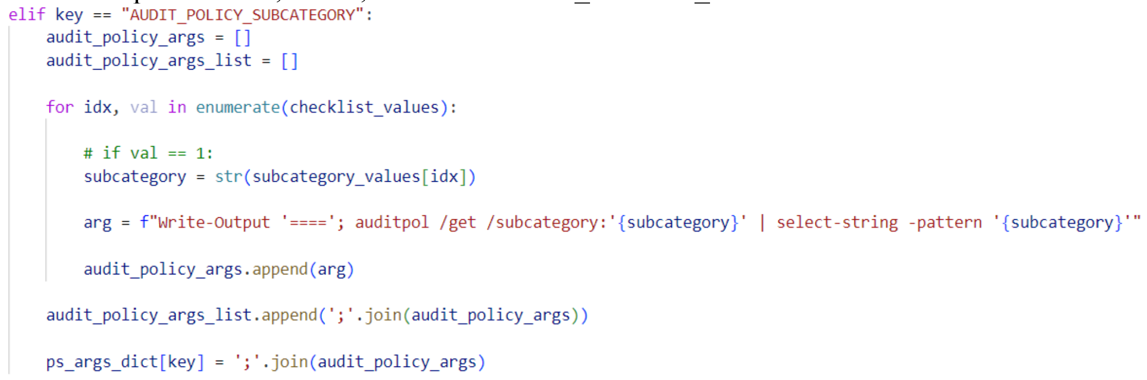
```
elif key == "BANNER_CHECK":
    banner_check_args = []
    banner_check_args_list = []

    for idx, val in enumerate(checklist_values):
        # if val == 1:
        # generate command list for getting regristry value
        reg_key = str(reg_key_values[idx])
        reg_item = str(reg_item_values[idx])

        if reg_key.startswith("HKLM"):
            reg_key = reg_key.replace("HKLM", "HKLM:")
        elif reg_key.startswith("HKU"):
            reg_key = reg_key.replace("HKU", "HKU:")

        arg = f"Write-Output '====';Get-ItemPropertyValue -Path '{reg_key}' -Name '{reg_item}'"
        banner_check_args.append(arg)

    banner_check_args_list.append(';'.join(banner_check_args))

    ps_args_dict[key] = ';'.join(banner_check_args)
```

- This is the place to add, delete, and update ‘ANONYMOUS_SID_SETTING’ commands.



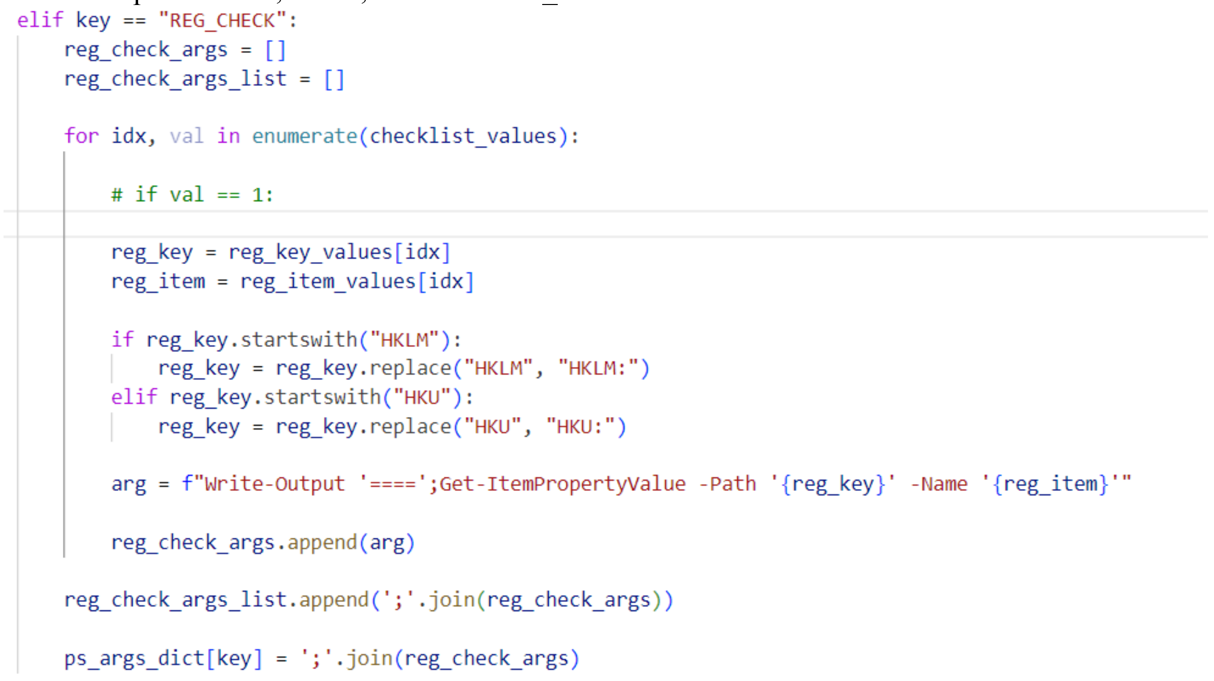
```
elif key == "ANONYMOUS_SID_SETTING":

    anonymous_sid_args = []
    anonymous_sid_args_list = []

    for idx, val in enumerate(checklist_values):
        # if val == 1:

        # generate command list for getting password policy value
        description = str(description_values[idx])

        if "Allow anonymous SID/Name translation" in description:
            subcategory = 'LSAAnonymousNameLookup ='

        arg = f"Write-Output '===='; Get-Content -Path C:\\temp\\secpol.cfg | Select-String -Pattern '{subcategory}'"

        anonymous_sid_args.append(arg)

    anonymous_sid_args_list.append(';'.join(anonymous_sid_args))

    ps_args_dict[key] = ';'.join(anonymous_sid_args)
```

- This is the place to add, delete, and add ‘AUDIT_POLICY_SUBCATEGORY’ commands.



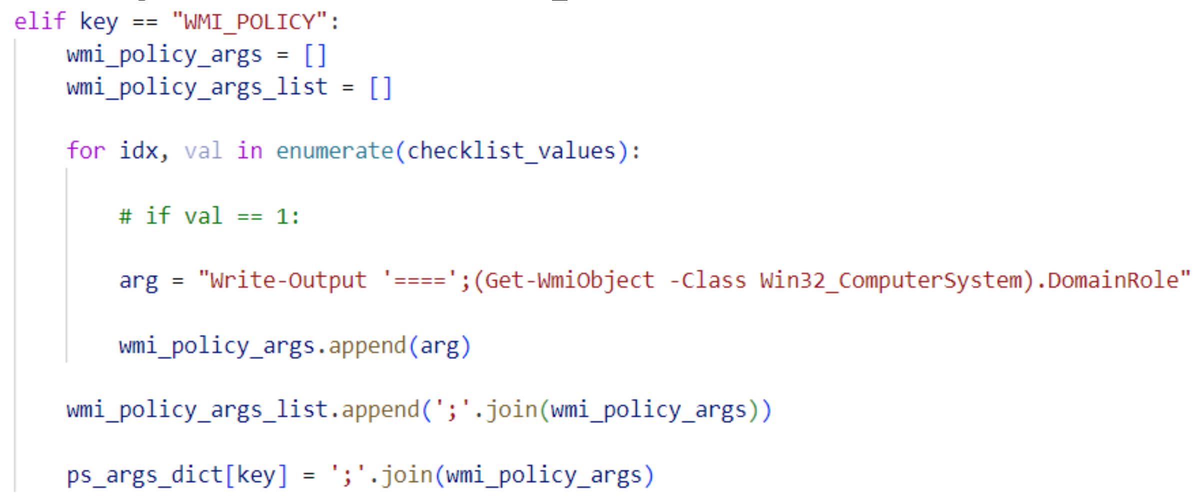
```
elif key == "AUDIT_POLICY_SUBCATEGORY":
    audit_policy_args = []
    audit_policy_args_list = []

    for idx, val in enumerate(checklist_values):

        # if val == 1:
        subcategory = str(subcategory_values[idx])

        arg = f"Write-Output '===='; auditpol /get /subcategory:'{subcategory}' | select-string -pattern '{subcategory}'"

        audit_policy_args.append(arg)

    audit_policy_args_list.append(';'.join(audit_policy_args))

    ps_args_dict[key] = ';'.join(audit_policy_args)
```

- This is the place to add, delete, and add ‘REG_CHECK’ commands.



```
elif key == "REG_CHECK":
    reg_check_args = []
    reg_check_args_list = []

    for idx, val in enumerate(checklist_values):

        # if val == 1:

        reg_key = reg_key_values[idx]
        reg_item = reg_item_values[idx]

        if reg_key.startswith("HKLM"):
            reg_key = reg_key.replace("HKLM", "HKLM:")
        elif reg_key.startswith("HKU"):
            reg_key = reg_key.replace("HKU", "HKU:")

        arg = f"Write-Output '====';Get-ItemPropertyValue -Path '{reg_key}' -Name '{reg_item}'"

        reg_check_args.append(arg)

    reg_check_args_list.append(';'.join(reg_check_args))

    ps_args_dict[key] = ';'.join(reg_check_args)
```

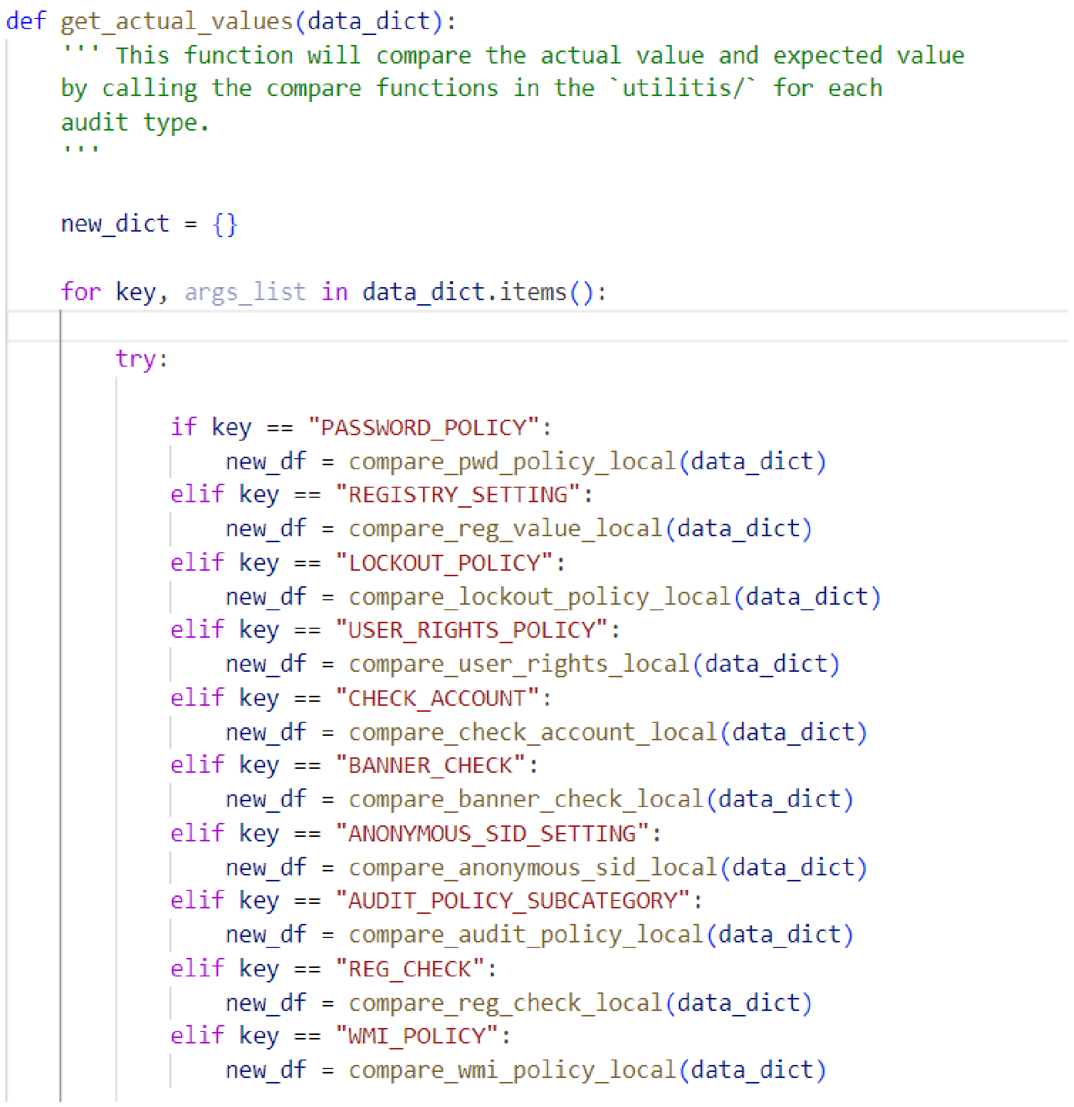
- This is the place to add, delete, and add ‘WMI_POLICY’ commands.



```
elif key == "WMI_POLICY":
    wmi_policy_args = []
    wmi_policy_args_list = []

    for idx, val in enumerate(checklist_values):

        # if val == 1:

        arg = "Write-Output '===';(Get-WmiObject -Class Win32_ComputerSystem).DomainRole"

        wmi_policy_args.append(arg)

    wmi_policy_args_list.append(';'.join(wmi_policy_args))

    ps_args_dict[key] = ';'.join(wmi_policy_args)
```

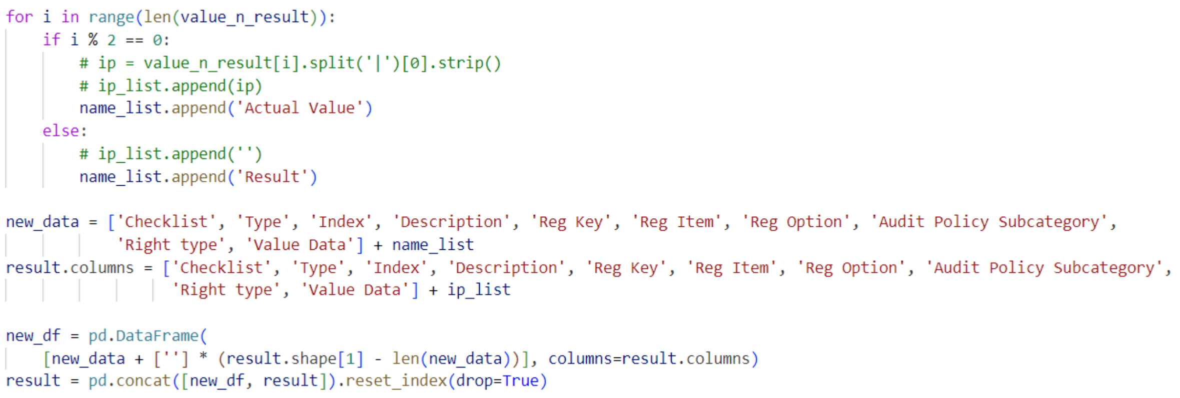
local_audit_results_processor.py

- This is the place to modify the audit type name, if it has been updated in `audit_file_parser.py`.



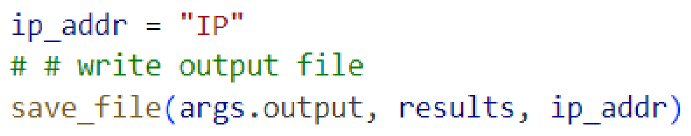
```python
def get_actual_values(data_dict):
    ''' This function will compare the actual value and expected value
    by calling the compare functions in the `utilitis/` for each
    audit type.
    '''

    new_dict = {}

    for key, args_list in data_dict.items():

        try:

            if key == "PASSWORD_POLICY":
                new_df = compare_pwd_policy_local(data_dict)
            elif key == "REGISTRY_SETTING":
                new_df = compare_reg_value_local(data_dict)
            elif key == "LOCKOUT_POLICY":
                new_df = compare_lockout_policy_local(data_dict)
            elif key == "USER_RIGHTS_POLICY":
                new_df = compare_user_rights_local(data_dict)
            elif key == "CHECK_ACCOUNT":
                new_df = compare_check_account_local(data_dict)
            elif key == "BANNER_CHECK":
                new_df = compare_banner_check_local(data_dict)
            elif key == "ANONYMOUS_SID_SETTING":
                new_df = compare_anonymous_sid_local(data_dict)
            elif key == "AUDIT_POLICY_SUBCATEGORY":
                new_df = compare_audit_policy_local(data_dict)
            elif key == "REG_CHECK":
                new_df = compare_reg_check_local(data_dict)
            elif key == "WMI_POLICY":
                new_df = compare_wmi_policy_local(data_dict)
```

- This is the place to modify the column name of the output Excel file. It must be modified if the number of columns has been changed.



```python
for i in range(len(value_n_result)):
    if i % 2 == 0:
        # ip = value_n_result[i].split('|')[0].strip()
        # ip_list.append(ip)
        name_list.append('Actual Value')
    else:
        # ip_list.append('')
        name_list.append('Result')

new_data = ['Checklist', 'Type', 'Index', 'Description', 'Reg Key', 'Reg Item', 'Reg Option', 'Audit Policy Subcategory',
            'Right type', 'Value Data'] + name_list
result.columns = ['Checklist', 'Type', 'Index', 'Description', 'Reg Key', 'Reg Item', 'Reg Option', 'Audit Policy Subcategory',
                  'Right type', 'Value Data'] + ip_list

new_df = pd.DataFrame(
    [new_data + [''] * (result.shape[1] - len(new_data))], columns=result.columns)
result = pd.concat([new_df, result]).reset_index(drop=True)
```

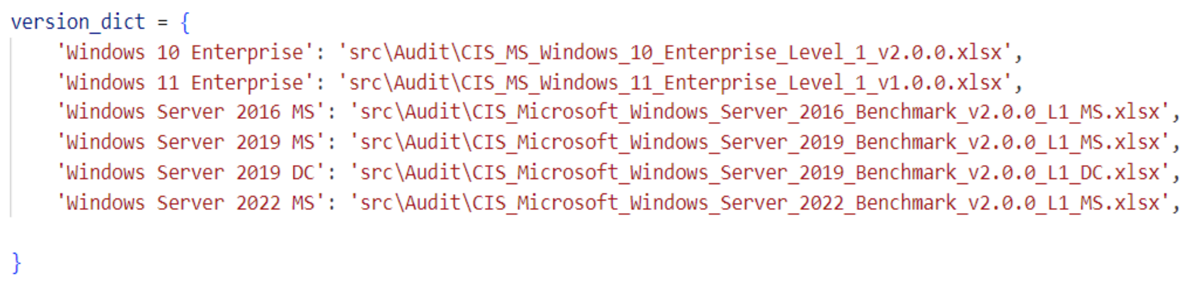
- This is the place to update the IP address column of the output Excel file. (Not necessary)



```
ip_addr = "IP"
# # write output file
save_file(args.output, results, ip_addr)
```

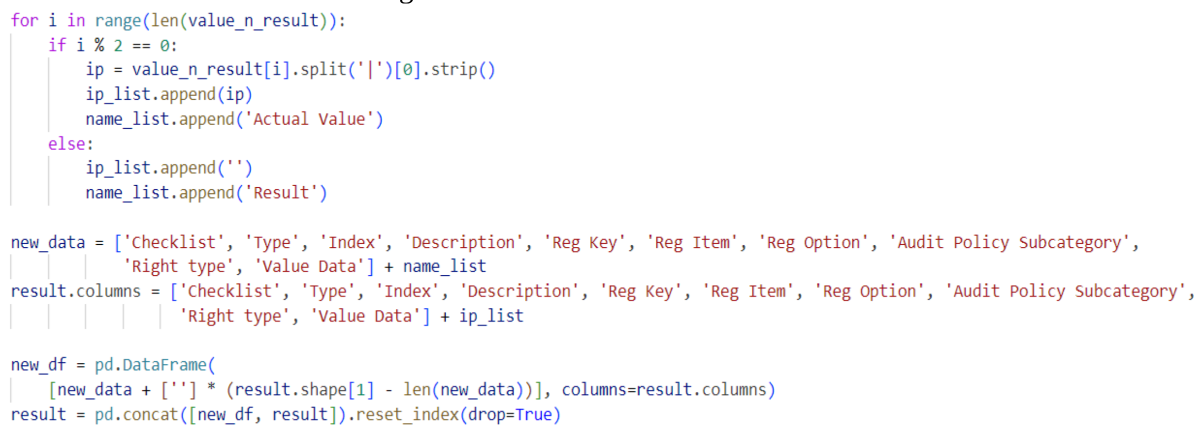
remote_audit_executor.py

- For the modification on `gen_ps_args()`, please refer to `local_audit_command_generator.py`
- This is the place to update Windows version and its corresponding audit file path.



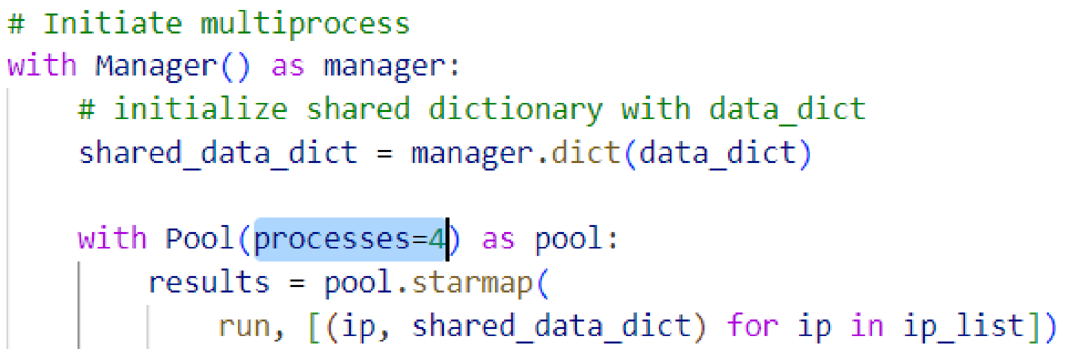
```
version_dict = {
    'Windows 10 Enterprise': 'src\Audit\CIS_MS_Windows_10_Enterprise_Level_1_v2.0.0.xlsx',
    'Windows 11 Enterprise': 'src\Audit\CIS_MS_Windows_11_Enterprise_Level_1_v1.0.0.xlsx',
    'Windows Server 2016 MS': 'src\Audit\CIS_Microsoft_Windows_Server_2016_Benchmark_v2.0.0_L1_MS.xlsx',
    'Windows Server 2019 MS': 'src\Audit\CIS_Microsoft_Windows_Server_2019_Benchmark_v2.0.0_L1_MS.xlsx',
    'Windows Server 2019 DC': 'src\Audit\CIS_Microsoft_Windows_Server_2019_Benchmark_v2.0.0_L1_DC.xlsx',
    'Windows Server 2022 MS': 'src\Audit\CIS_Microsoft_Windows_Server_2022_Benchmark_v2.0.0_L1_MS.xlsx',

}
```

- This is the place to modify the column name of the output Excel file. It must be modified if the number of columns has been changed.



```
for i in range(len(value_n_result)):
    if i % 2 == 0:
        ip = value_n_result[i].split('|')[0].strip()
        ip_list.append(ip)
        name_list.append('Actual Value')
    else:
        ip_list.append('')
        name_list.append('Result')

new_data = ['Checklist', 'Type', 'Index', 'Description', 'Reg Key', 'Reg Item', 'Reg Option', 'Audit Policy Subcategory',
            'Right type', 'Value Data'] + name_list
result.columns = ['Checklist', 'Type', 'Index', 'Description', 'Reg Key', 'Reg Item', 'Reg Option', 'Audit Policy Subcategory',
                  'Right type', 'Value Data'] + ip_list

new_df = pd.DataFrame(
    [new_data + [''] * (result.shape[1] - len(new_data))], columns=result.columns)
result = pd.concat([new_df, result]).reset_index(drop=True)
```

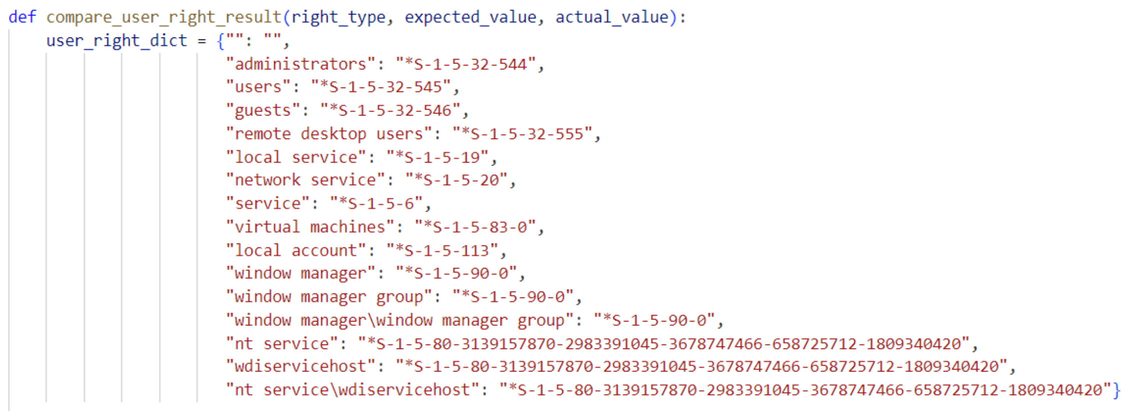
- This is the place to modify the number of processes.



```
# Initiate multiprocess
with Manager() as manager:
    # initialize shared dictionary with data_dict
    shared_data_dict = manager.dict(data_dict)

    with Pool(processes=4) as pool:
        results = pool.starmap(
            run, [(ip, shared_data_dict) for ip in ip_list])
```

utilities\getUserRights.py

- This the place to update use right security identifiers. Please refer to https://learn.microsoft.com/en-us/windows-server/identity/ad-ds/manage/understand-security-identifiers



```
def compare_user_right_result(right_type, expected_value, actual_value):
    user_right_dict = {"": "",
                       "administrators": "*S-1-5-32-544",
                       "users": "*S-1-5-32-545",
                       "guests": "*S-1-5-32-546",
                       "remote desktop users": "*S-1-5-32-555",
                       "local service": "*S-1-5-19",
                       "network service": "*S-1-5-20",
                       "service": "*S-1-5-6",
                       "virtual machines": "*S-1-5-83-0",
                       "local account": "*S-1-5-113",
                       "window manager": "*S-1-5-90-0",
                       "window manager group": "*S-1-5-90-0",
                       "window manager\window manager group": "*S-1-5-90-0",
                       "nt service": "*S-1-5-80-3139157870-2983391045-3678747466-658725712-1809340420",
                       "wdiservicehost": "*S-1-5-80-3139157870-2983391045-3678747466-658725712-1809340420",
                       "nt service\wdiservicehost": "*S-1-5-80-3139157870-2983391045-3678747466-658725712-1809340420"}
```

PowerShell Commands

This section provides a brief overview of the PowerShell commands used in the security audit. Each audit type uses specific PowerShell commands to retrieve the required information from the remote host. Here are some examples:

- REGISTRY_SETTING / BANNER_CHECK / REG_CHECK
  - Get-ItemPropertyValue -Path '{reg_key}' -Name '{reg_item}'
  - e.g., Get-ItemPropertyValue -Path 'HKLM:\\Software\\Microsoft\\Windows NT\\CurrentVersion' -Name "ProductName"

- PASSWORD_POLICY / ANONYMOUS_SID_SETTING
  - if (!(Test-Path -Path C:\temp)) { New-Item -ItemType directory -Path C:\temp }
  - secedit /export /cfg C:\temp\secpol.cfg /areas SECURITYPOLICY
  - $secpol = Get-Content -Path C:\temp\secpol.cfg
  - $secpol | Select-String -Pattern '{subcategory}'
  - e.g., $secpol | Select-String -Pattern "PasswordHistory"

- USER_RIGHTS_POLICY
  - if (!(Test-Path -Path C:\temp)) { New-Item -ItemType directory -Path C:\temp }
  - secedit /export /cfg C:\temp\secpol.cfg /areas user_rights
  - $secpol = Get-Content -Path C:\temp\secpol.cfg
  - $secpol | Select-String -Pattern " right_type"
  - e.g., $secpol | Select-String -Pattern "SeNetworkLogonRight"

- LOCKOUT_POLICY
  - net accounts
  - net accounts | Select-String -Pattern "{subcategory}"

- CHECK_ACCOUNT
  - net user guest
  - net user administrator
  - net user administrator | select-string -pattern "{subcategory}"

- AUDIT_POLICY_SUBCATEGORY
  - auditpol /get /subcategory:'{subcategory}'
  - e.g., auditpol /get /subcategory:"Special Logon"

- WMI_POLICY
  - (Get-WmiObject -Class Win32_ComputerSystem).DomainRole

Reference

Enable Windows Logins for Local and Remote Audits:
https://docs.tenable.com/nessus/Content/EnableWindowsLoginsForLocalAndRemoteAudits.htm

Tenable Audit File Search:
https://www.tenable.com/audits/search?q=CIS+MS+Windows++Level+1&sort=&page=1